

LETTERS TO THE EDITOR.

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The Effect of Light on Long Ether Waves.

THE curious and important observation made by Mr. Marconi on the basis of experience in long-distance wireless telegraphy exhibits a strange kind of interference between ether waves of very different lengths. The extremely short waves which ionise air interfere with the easy transmission of the long waves which are originated by alternating electric currents, and may conceivably have something to do with the optical opacity of dry haze.

Since many scientific men besides physicists read NATURE, it may be permissible to explain that this is an entirely different effect from the purely localised bands of interference which accompany the superposition of wave motions, and are a matter of simple geometry. In this phenomenon of interference bands there is no destruction, only redistribution, of energy; and there is nothing akin to opacity, whether of the absorbent or the reflective kind. It is, moreover, purely an affair of the ether. Whereas opacity is always an effect brought about by the presence of matter in the path of ether waves, the ions or electrons which are liberated from matter by exceedingly short waves raise a barrier or act as a reflector to extremely long ones. Thus the phenomenon depends on the interaction between free ether and electrified particles immersed in it.

A study of the details of this phenomenon cannot fail to be instructive, and the Radio-telegraphic Committee of the British Association had made preparation for getting facts recorded during the solar eclipse of August, 1914. The war prevented anything being done, but now, as Prof. Fleming—the father of the committee—suggests in NATURE of January 23, another opportunity presents itself in the eclipse of the afternoon of May 29, when the line of totality passes across the South Atlantic from South America to Africa, crossing Ceara, in Brazil, and Princes Island, in the Gulf of Guinea. The astronomers going from this country will have their hands full, but a special group of wireless experts might accompany the expedition if funds were available. It seems probable that assistance might be rendered more readily by the United States than by this country. Prof. Eccles, the secretary of the British Association Wireless Committee, is still too engaged at present with Admiralty work to superintend operations, but the Astronomer Royal has informed him that Dr. Bauer, the head of the Carnegie Institution of Washington, has already made plans for observations on magnetism and atmospheric electricity, and may be planning to take charge of radio-telegraphic observations also. Several months ago Prof. Eccles sent to Dr. Bauer the documents prepared for recording wireless phenomena on the occasion of the previous solar eclipse in 1914, and is again communicating with him. And thus we trust that Prof. Fleming's admirable suggestion will be carried out.

OLIVER J. LODGE,

Chairman of the British Association

February 4. Radio-telegraphic Committee.

The Aggregate Recoil of Radio-active Substances Emitting α -Rays.

THE November (1918) issue of the *Philosophical Magazine* has just reached us, and I have read with great interest the results of some remarkable experi-

ments by Mr. S. Ratner "On Some Properties of the Active Deposit of Radium." The paper in question deals with the spontaneous transference of active matter from the surface of a plate covered with the active deposit of radium to other objects placed near it.

This effect has been repeatedly observed by workers in radio-activity, and has been attributed (1) to a slight volatility of the active deposit at ordinary temperatures, or (2) to the recoil of a compact cluster of atoms of the active matter when one of the atoms contained in it disintegrates with ejection of an α -particle. To this latter phenomenon I recently gave the name of "aggregate recoil."

Mr. Ratner deals with both possibilities, and arrives at the conclusion that neither of them satisfies the requirements of his results. He states that his experiments "have failed to disclose the nature of the phenomenon."

During the last four years I have been engaged at intervals on experiments of a similar kind, performed with the object of explaining the almost inevitable and unavoidable contamination with polonium of electroscopes and ionisation vessels used in experiments with this substance. In 1915 I made mention of this phenomenon in a paper published in the *Communications* of this institute (No. 80), and suggested the possibility mentioned under (2) above in explanation of it, although I had, unfortunately, overlooked the fact that Makower and Russ had made the same suggestion in 1910 until I read Mr. Ratner's paper yesterday.

My subsequent experiments with polonium, done for the most part in the summer of 1917, lend strong support to the idea of aggregate recoil as the cause of this "wandering" of the active matter. Inasmuch as I obtained quite appreciable effects with polonium, my results disagree with those of Mr. Ratner; in fact, I have not a single observation which is not adequately explicable in this manner. In No. 113 of the *Communications* of this institute, which was published in July, 1918, I discussed this phenomenon, and examined the part played by the disintegration of the active foil ("spluttering") due to the bombardment of α -particles. It was found that, in general, much less than 1 per cent. of the total effect is due to the latter cause. A further paper on aggregate recoil is at present in the press, and the work is still in progress.

As I am returning home in the course of a few weeks, I hope before long to publish the results of these experiments in the *Philosophical Magazine*, as well as others of a similar nature done last summer with the active deposit of radium. I beg to mention, however, that, in the light of my own work, I am of the opinion that almost all, if not all, of Mr. Ratner's results are in harmony with the recoil of aggregates of atoms of active matter, as originally suggested by Makower and Russ in explanation of the phenomenon in question.

Like Mr. Ratner, I regard the so-called β -recoil of radium-C from radium-B as a theoretical possibility, which it will be impossible to realise in practice. My reasons for the latter conclusion are contained in my July publication. Dr. Lise Meitner, to whom I mentioned my results last summer, informed me that she no longer believes in the practicability of achieving a transference of active matter by β -recoil. She agreed that the idea of aggregate recoil in the manner above suggested is much more in harmony with the experimental results, and she informed me that Prof. Hahn and herself had never been able to obtain pure radium-C by the postulated β -recoil method.

Before closing this letter, I should like to make

mention of the extreme courtesy and kindness shown to me by the Austrian physicists, in particular by Director Prof. Stefan Meyer and Prof. Heinrich Mache, and the other gentlemen associated with this institute, throughout the period of my confinement here since the beginning of the war. They have stood by me through thick and thin, and were never weary in doing what they could to alleviate the strain of life under such unusual conditions. Thanks to their intervention on my behalf, I was given every facility for continuing my research work in the institute, and I have been at all times aided and stimulated in my work by their helpful criticism and encouraging interest.

ROBERT W. LAWSON,

Formerly Pemberton Fellow of the University
of Durham.

Vienna Radium Institute, January 5.

Ripple Marks due to High Pressure.

WHILE in London and examining the German guns in the Mall, I came across one with a burst shell in its breech, which is probably a unique curiosity, and possibly of value to geologists and others who are interested in the flow of solids. The shell seems to have burst while being loaded into the gun, and, although it is well opened out, only a small portion is missing. The retained pieces are of interest, for on their inner surfaces they are covered with a large number of small patches of very fine ripple marks. These must have been produced under the intense pressure of the explosion, for it is well known that the insides of shells are turned smooth, polished, and varnished. It is, of course, difficult to say whether a study of these ripple marks will prove of scientific value, but seeing that the gun and its shell are probably exposed to the rain, and as these unique ripple marks may soon corrode away, I should like to suggest that this particular gun and its shell should be protected against further injury by being removed to a geological museum, or, perhaps, to the United Service Institution.

C. E. STROMEYER.

Lancefield, West Didsbury, February 6.

WAR NEUROSES AND "MIRACLE" CURES

IN a London daily paper there appeared recently a dramatic account of a blind Italian soldier suddenly recovering his sight at the door of the church where his bride awaited him. It is not generally known that similar "miracles" occur in this country, and the present writer has been fortunate in witnessing them in considerable number. A brief account of these conditions where the disability is rapidly curable is not without interest, for the war has produced thousands of such cases, and it is a startling fact that many sufferers have been discharged from the Army as "permanently unfit" who might otherwise be doing useful work. To remedy this state of affairs several neurological hospitals have been established, where the study and treatment of war neuroses can be carried out. The recognition that certain disablements are partly or wholly functional is of the greatest importance, for what at first might appear a hopeless condition becomes one that is curable, or, at any rate, can be markedly alleviated. Much original work on this subject has been done by Babinski, in Paris, and by

Lt.-Col. Hurst, at Seale Hayne Neurological Hospital, Newton Abbot. Some interesting statistics were recently completed at the latter institution. It was found that the average length of time during which one hundred soldiers had been completely incapacitated owing to disabled legs or arms was eleven months. The average length of time taken to cure ninety-six of these was fifty-four minutes. Of the remaining four, one took one month, two were cured in three weeks, while the fourth required four days before recovery was obtained. The rapidity of the cure was due to the fact that the disabilities were recognised as being not organic, but functional, in character before treatment was carried out.

The origin of a functional disability in a soldier has both a physical and a psychical foundation. Few, if any, cases have been recorded as the result of the fighting in South Africa, 1899-1902. The conditions, however, under which the soldier has fought in the present war have been wholly different.

Trench warfare for prolonged periods under the most adverse climatic conditions, the high explosives causing concussion and burial, profound exhaustion following continued marching and fighting, with all the accompanying revolting sights of war, the strain of responsibility, and the suppression of emotions, are only some of the factors to be borne in mind with regard to the causation of nervous instability. It is worthy of note that there is frequently no history whatever of previous nervous trouble in the soldier who eventually succumbs to the stress and strain of military service. The ordeal through which he has passed tends to make him more impressionable or suggestible, and symptoms of hysteria are liable to supervene.

At Seale Hayne Hospital the term "hysteria" is used to describe any disability produced by auto- or hetero-suggestion which is curable by psychotherapy, by which is meant the treatment by explanation to the patient as to how the abnormal condition was brought about, and how it can be cured. His confidence must be obtained, and the explanation made simple enough for him to understand. This may be followed up, in certain cases, by re-education of muscles, active and passive movements, and persuasion. This definition will be more readily understood if a few cases, or types of cases, frequently met with are very briefly described.

A soldier sprained his ankle and immediately afterwards was rendered unconscious by the explosion of a shell. On recovering consciousness he found he had lost the power in his legs. The concussion or shock had, for the time, paralysed him, and there may have been some actual damage to his spinal cord. The time came, however, when these organic changes had passed away; but the patient was convinced in his own mind that he was permanently injured, and had given up trying to walk properly. Eight months after the onset of his symptoms the loss of power and the drop foot were recognised as being func-